UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/046,196	01/16/2002	Marshall W. Bern	105886	3066

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EXAMINER
CHANG, JON CARLTON

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 04/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/046,196	BERN ET AL.
	Examiner	Art Unit	
	Jon Chang	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2002*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
   closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-21 and 23-25* is/are rejected.

7)☒ Claim(s) *6 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
      application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date *1/16/02*.

4)☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____ .

Information Disclosure Statement

1.   With regard to the Information Disclosure Statement filed January 16, 2002, the

document listed as "09/749,690 (Atty Dckt. 105887)" in the U.S. Patent Documents

section of the PTO-1449 has been lined-out. U.S. Patent 6,690,821, which issued from

U.S. Patent Application Serial number 09/749,690, has been cited on the attached PTO-

892 in lieu of this document.

Response to Applicants' Amendment

2.   The amendment filed January 16, 2002, has been entered and made of record.

Specification

3.   The disclosure is objected to because of the following informalities:

a) In paragraph [003], line 9, "computer should read, "compute".

b) The status of U.S. Patent Application mentioned at paragraph [0059] should

be updated (e.g., the Patent Number should be added).

Appropriate correction is required.

4.   The disclosure is objected to because it contains an embedded hyperlink and/or

other form of browser-executable code. Applicant is required to delete the embedded

hyperlink and/or other form of browser-executable code. See MPEP § 608.01. The

embedded hyperlinks are in paragraphs [0049] and [0072].

Claim Rejections - 35 USC § 112

5.   Claims 10, 20 and 21 are rejected under 35 U.S.C. 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention.

a) Claim 10 is not grammatically correct, and does not make sense. There may

be some words missing.

b) In claim 20, "the threshold" lacks antecedent basis.

c) In claim 21, "the smaller cluster set" and "the larger cluster set" lack

antecedent basis.

Claim Rejections - 35 USC § 102

6.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7.   Claims 1-5, 7-9, 11-20 and 23-25 are rejected under 35 U.S.C. 102(b) as being

clearly anticipated by the article, "Scanner-Model_Based Document Image

Improvement" by Bern et al. (hereinafter "Bern").

Regarding claim 1, Bern discloses a method for improving appearance of

captured bilevel image data, comprising:

receiving a degraded input bilevel image (this is implied by the first paragraph of section 1);

connecting dark pixels in the input image to adjacent dark pixels to form connected components comprising a set of dark pixels connected either diagonally or orthogonally and surrounded by white pixels (section 1, second paragraph; section 3.2, first paragraph);

performing initial clustering of individual connected components (section 3.2);

determining a "most likely" cluster representative by use of a probabilistic model of the scanner used for scanning (section 1, second paragraph, section 3.1; section 3.3); and

assembling the sets by substituting the "most-likely" cluster representative for each family member of each cluster set to form an output image (section 3.6, second paragraph).

Regarding claim 2, Bern discloses the method of claim 1, wherein the step of performing initial clustering includes pair-wise matching connected components and determining a match if the pair are within a certain threshold of matching to form cluster sets, each with one or more family members formed of individual connected components (section 3.2, third paragraph, wherein the "Hausdorff matching is a pair-wise matching); and

the step of determining a "most likely" cluster representative for each cluster set uses a optimization procedure in which at least one iteration of pixel flipping is

performed (section 3.3, last paragraph, the "hill-climbing heuristic" is an optimization procedure).

As t o claim 3, Bern discloses the method of claim 2, wherein the optimization procedure is a hill-climbing optimization procedure (section 3.3, last paragraph).

Regarding claim 4, Bern discloses the method of claim 2, wherein an initial representative is determined by finding a translation .tau. of each family member that maximizes the probability that the family member is a given original image to obtain a higher resolution histogram (section 3.3, especially the last paragraph).

Regarding claim 5, Bern discloses the method of claim 2, wherein an initial representative is determined by summing scans of each maximized family member to form a double-resolution histogram (section 3.3, last paragraph).

With regard to claim 7, Bern discloses the method of claim 1, further comprising a step of reclustering by comparing cluster representatives of clusters (section 3.5).

Regarding claim 8, Bern discloses the method of claim 7, wherein the step of reclustering reclusters the cluster sets by comparing cluster representatives of smaller cluster sets with cluster representatives of larger cluster sets and merging the smaller cluster set into the larger cluster set when a normalized probability exceeds a default threshold (section 3.5) .

As to claim 9, Bern discloses the method of claim 2, wherein the initial clustering includes:

forming a bounding box around each connected component A and B (section 3.2, second paragraph);

aligning connected components A and B to each other by aligning centers of their bounding boxes (section 3.2, second paragraph); and

determining a match of the connected components A and B based on the recited relation (section 3.2, second paragraph).

Regarding claim 11, Bern discloses all of the recited limitations in section 3.3, especially the first 2 paragraphs).

Regarding claim 12, Bern discloses all of the recited limitations in section 3.3, third paragraph.

Regarding claim 13, Bern discloses all of the recited limitations in section 3.3, fourth paragraph, and equation (1).

As to claim 14, Bern discloses the method of claim 13, wherein connected component A and given original image region B are prealigned by the centroids of their respective bounding boxes (section 3.3, paragraph 4).

As to claim 15, Bern discloses the method of claim 14, wherein optimization of .tau. is limited to the nine shortest vectors in the lattice of the bounding box (section 3.3, paragraph 4; the translations −1, 0 or 1 are the shortest).

As to claim 16, Bern discloses all of the recited limitations in section 3.3, paragraph 5.

With regard to claim 17, Bern discloses the method of claim 1, further comprising using chain codes to define a priori probabilities to find the cluster representative (section 3.4, first and second paragraphs, especially the second).

With regard to claim 18 Bern discloses that the a priori probability is computed by determining the product of transition probabilities around all connected components of the cluster representative to attain a value B^i and the "most likely" representative is the B^i with a maximum $P[C|B^i]$ (section 3.4, second and third paragraphs)

As to claim 19, Bern discloses the method of claim 7, wherein the step of reclustering is performed by normalizing probabilities using $N[A_i|B_j]=(P[A_i|B_j])^{1/p}$, where p is the number of pixels in the connected component A.sub.i (aligned with the representative image B.sub.j) that are within a sensor disk's radius of a black pixel in either the connected component A_i or the representative image B_j (section 3.5)

As to claim 20 Bern discloses the method of claim 19, wherein the threshold is 0.70 (section 3.5).

Regarding claim 23, Bern discloses the method of claim 1, further comprising a step of breaking run-through letters by computing a sequence of breakable positions of singleton cluster representatives and comparing each breakable position portion with other cluster representatives (section 3.6, first paragraph).

Regarding claim 24, Bern discloses the method of claim 23, further comprising a step of merging a breakable position portion with a cluster set when the comparison indicates a sufficient match (section 3.6, first paragraph; the sufficient match is determined by the threshold).

As to claim 25, Bern discloses the method of claim 1, wherein the step of assembly includes aligning centers of bounding boxes and testing double-resolution translations to recompute alignment and determine the most likely position of the cluster

representative (section 3.2, second and third paragraphs; section 3.3, fourth and last

paragraphs).

Allowable Subject Matter

8.   Claims 6 and 22 are objected to as being dependent upon a rejected base claim,

but would be allowable if rewritten in independent form including all of the limitations of

the base claim and any intervening claims.

9.   Claims 10 and 21 would be allowable if rewritten to overcome the rejection(s)

under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of

the limitations of the base claim and any intervening claims.

References Cited

10.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

U.S. Patent 6,658,151 to Lee et al. discloses a system for extracting information

from symbolically compressed document images, and teaches as prior art the clustering

of connected components.

U.S. Patent 6,674,900 to Ma et al. discloses a method for extracting titles from

images, which, among other things, clusters connected components.

"Image Enhancement Using Watershet-Based Maximum Homogeneity Filtering"

by Hansen et al. teaches clustering groups of connected pixels into catchment basins,

and averaging together similar neighboring catchment basins to compute a filtered

image.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jon Chang whose telephone number is (571) 272-7417.

The examiner can normally be reached on M-F 8:00 a.m.-6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Amelia Au can be reached on (571)272-7414. The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

Jon Chang
Primary Examiner
Art Unit 2623

Jon Chang
April 18, 2005